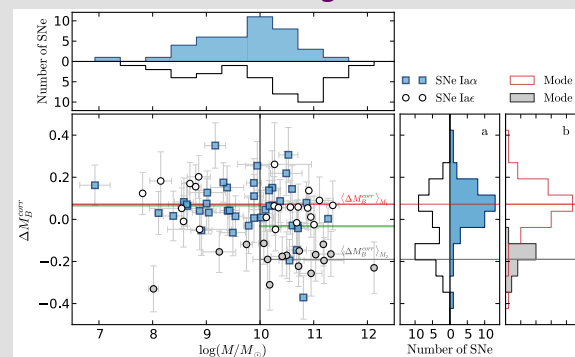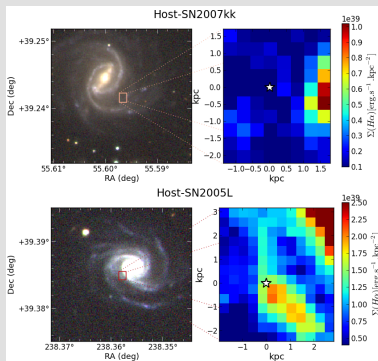# Environmental dependence of supernova brightness in the SNLS-5 years sample

Matthieu Roman,
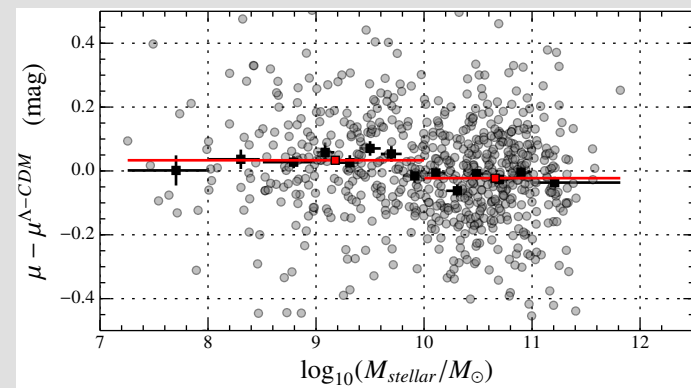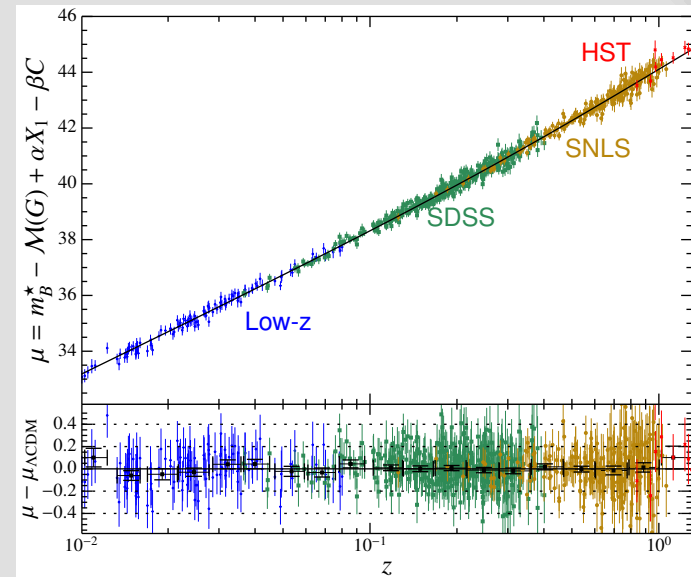
Delphine Hardin, Marc Betoule

Context

- Joint Light-Curve Analysis (JLA):
  - improved calibration accuracy
  - 0.15 mag remaining dispersion
- Correlations between supernova brightness and environment:
 - host stellar mass (JLA)
  - local Hα for low-z SNIa

Betoule et al. (2014)

*Rigault et al. 2013*

The SNLS-5 years sample

|	SN	Host photometry	Reference	Filters/Instrument
CSP	19	7	SDSS footprint, SIMBAD	$ugriz$/SDSS & JHK/2MASS
CfAIII	84	55	SDSS footprint, SIMBAD	$ugriz$/SDSS & JHK/2MASS
CfAIV	53	34	SDSS footprint, SIMBAD	$ugriz$/SDSS & JHK/2MASS
SDSS	441	389	Sako et al. 2014	$ugriz$/SDSS
SNLS	397	397	Hardin et al. 2017 (in prep.)	$ugriz$/MegaCam
Total	994	882	—	—
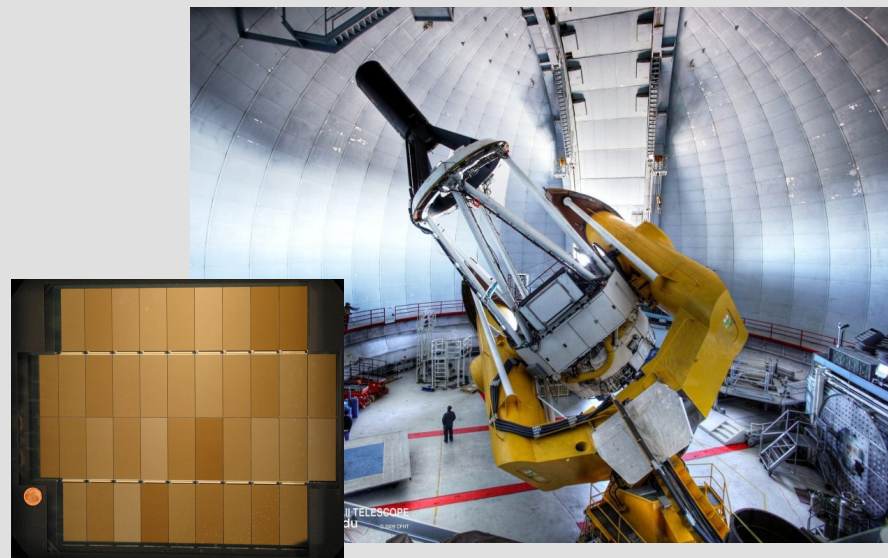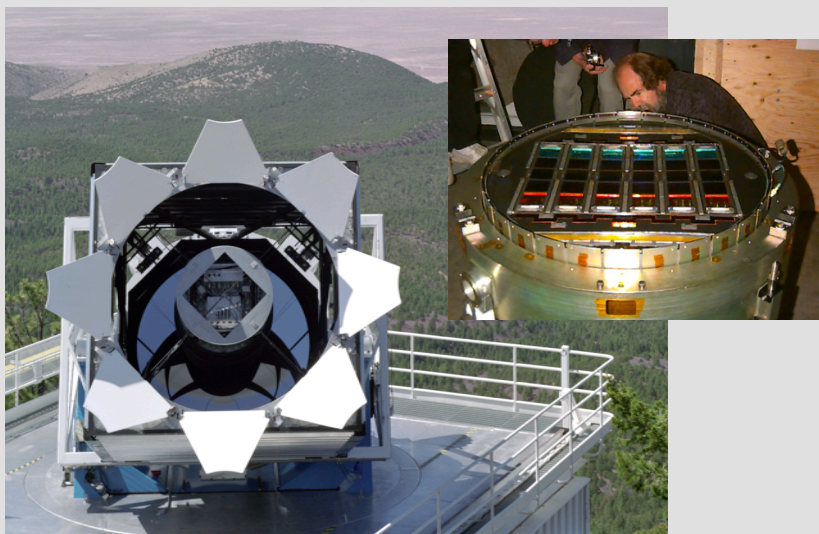
Local environment at ALL redshifts
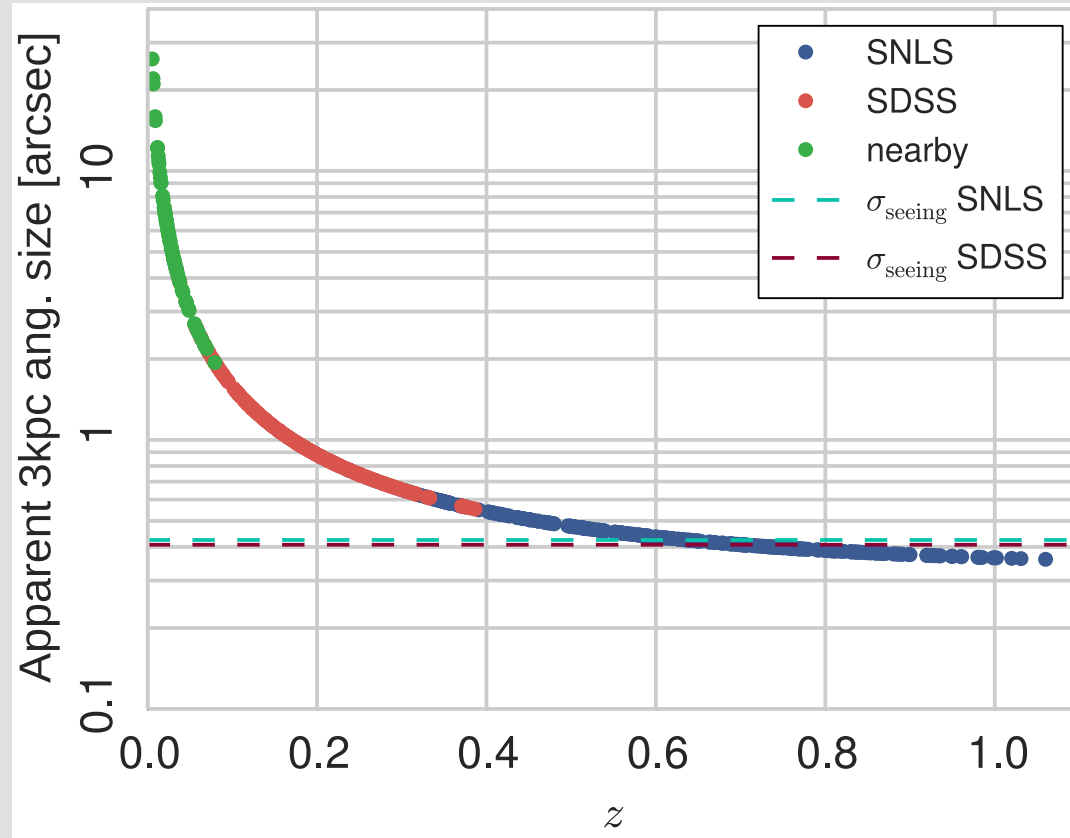
- Local and global photometry of 882 host galaxies of SNIa at ALL redshifts
- 3 kpc local radius
- rest-frame U-V colors by interpolating fluxes
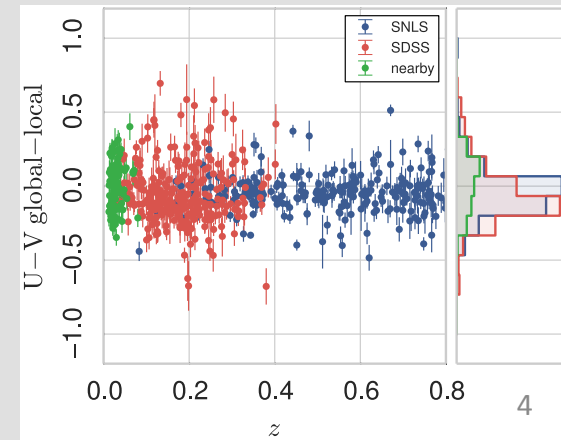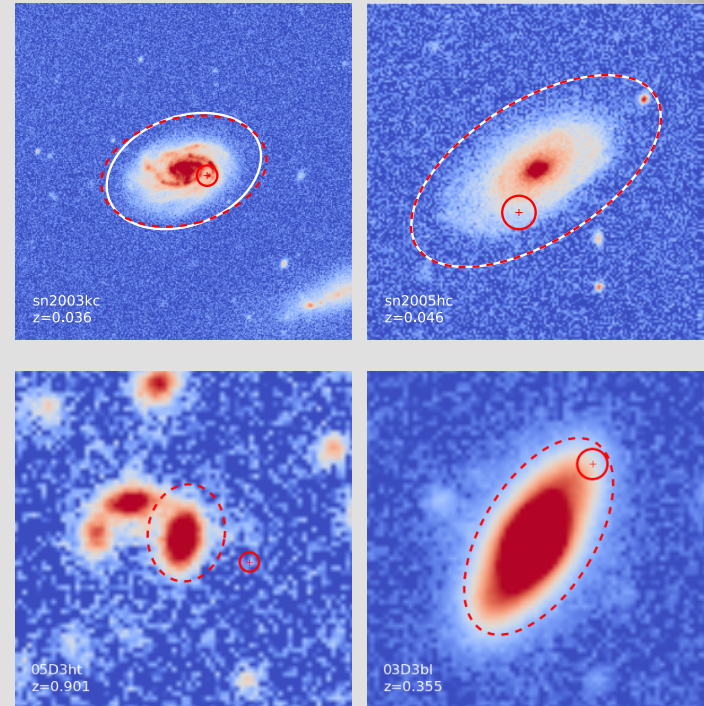
Local environment at ALL redshifts

- Local color as a third standardization parameter

- 7σ significance of the magnitude step

  – more significant than other variables (host stellar mass, galaxy color)

  – valid for different redshift ranges

$\Delta M_B = -0.092 \pm 0.013$
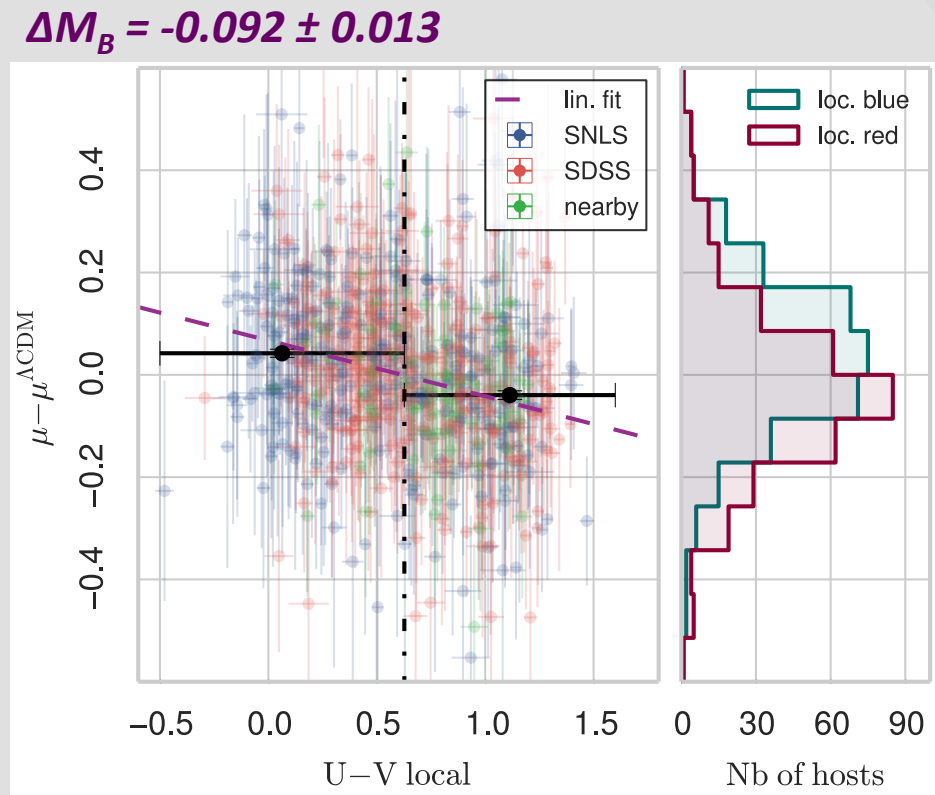
Roman et al. (2017, in prep.)

Conclusions

- First analysis of local environment of Type Ia supernovae at all redshifts and for a large sample

- Local color correlates more to Hubble diagram residuals than host stellar mass, host color

- Strong hint that luminosity variations can be reduced

- Type Ia supernovæ can become a major cosmological probe again: dark energy, expansion rate